CALIFORNIA JOURNAL OF ELEMENTARY EDUCATION

NOVEMBER, 1960

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VOLUME XXIX NOVEMBER, 1960 NUMBER 2

The California Journal of Elementary Education is published quarterly in August, November, February, and May by the California State Department of Education. It is distributed without charge to school officials in California primarily concerned with the administration and supervision of elementary education and to institutions engaged in the training of teachers for the elementary school. To others the subscription price is $1.00 a year; the price for single copies is 30 cents. Subscriptions should be sent to the Bureau of Textbooks and Publications.

Entered as second-class matter September 13, 1932, at the Post Office at Sacramento, California, under the Act of August 24, 1912.

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CONTENTS

OUTDOOR EDUCATION

	Page
Editorial Comment and News Notes	65
Water Conservation Taught by Outdoor Experiences — *Maybelle De May*	67
The Nevada County Program of Conservation and Outdoor Conservation — *Mrs. Margaret J. Kell* and *Delton Pharis*	74
San Bernardino County's Conservation Painting Festival — *Mrs. Carol R. Poppett*	80
An All School Outdoor Education Program at the University Elementary School — *John D. Cunningham* and *Olga Richard*	82
Children Build a Nature Trail in Monterey County — *Edwin Leach*	92
Danville's Nature Trail	96
A School Nature Trail and Outdoor Laboratory in Eureka	98
Woodwardia Fire Study Develops Vital Conservation Concepts — *Mrs. Karen Elgin*	99
Successful Activities in Outdoor Science and Conservation Education	113
The Community Co-operates in Outdoor Education Programs	123

COVER PHOTOS

The front cover photograph of the nature trail of Washington Union High School District, Salinas, was provided by Dennis Rowedder, *Monterey Peninsula Herald*. The top picture on the back cover is of the same trail and by the same photographer. The middle picture was furnished by Los Angeles County Fire Department, E. Wagner, photographer. The bottom picture was furnished by East Whittier Elementary School District.

EDITORIAL COMMENT AND NEWS NOTES

This Issue of the Journal

The November, 1957, issue of the *California Journal of Elementary Education* was devoted to defining and describing outdoor education as viewed and practiced by several school districts then participating in school camping programs.

The California Education Code [1] provides authorization for such programs of "outdoor science and conservation education." It seemed appropriate, therefore, to collect and develop material for another *Journal* issue, this one to stress the following:

1. The interrelations between natural science, conservation, and outdoor education
2. The possibilities for conservation and outdoor education for all grade levels, kindergarten through eighth grade, either on the school grounds, within or adjacent to the immediate community as well as in the school camp at the sixth grade level
3. The stark survival value of conservation and outdoor education in a nuclear age

At the invitation of Helen Heffernan, Chief, Bureau of Elementary Education, California State Department of Education, and *Journal* Editorial Board member, the Executive Board of the Association for Outdoor Education, together with the Director of the Conservation Foundation's Curriculum Center, San Fernando Valley State College, met in September, 1959, to discuss with Miss Heffernan the purposes to be served by this issue and ways and means for developing it. At this meeting the following persons were chosen to serve as a committee to develop purposes, to plan ways and means, and to provide critical review of material collected.

Harold Adishian, Curriculum Assistant, Norwalk-La Mirada Public Schools; Howard Bell, Division of Instructional Services, Youth Services, Los Angeles

[1] Education Code Sections 7951, 7953.

City School Districts; John Cunningham, University Elementary School, University of California, Los Angeles; Rodney Ellsworth, Assistant Professor, University of California, Extension, Los Angeles; Leonard Hummel, Consultant in Elementary Curriculum, Office of the Superintendent of Schools, Los Angeles County; Dean Orahood, Director of Outdoor Education, Norwalk-La Mirada Public Schools; Dorothy Welch, Supervisor of Elementary Education, Long Beach City Unified School District.

Carl Brizzolara, Assistant Director of Curriculum, Division of Special Schools, Office of the Superintendent of Schools, Los Angeles County; Sue Erwin, Director of Elementary Curriculum, Bellflower Unified School District; William Noble, Curriculum Consultant, Office of the Superintendent of Schools, Santa Ana Public Schools; Mary Peters, Assistant Superintendent of Education, Ontario Elementary School District; Ruth Price, Director of Curriculum, Hawthorne Public Schools; Helen Rice, Consultant in Elementary Education-Science, Office of the Superintendent of Schools, Los Angeles County; Norman Tvedte, Principal of Monterey Avenue Elementary School, Burbank Unified School District; Gulla Ullensvang, Assistant Superintendent, Educational Services, Bassett Public Schools.

The following persons were designated as co-chairmen to co-ordinate and implement the committee's directions:

Elizabeth B. Hone, Associate Professor of Education, San Fernando Valley State College; Kenneth Pike, Past President, Association for Outdoor Education, Associate Professor, University of California, Los Angeles; Milton S. Rowen, Director, Outdoor Education, East Whittier City Elementary School District.

The co-chairmen are grateful to the responsible and talented members of the committee who found time to travel and spend one afternoon a month for an entire year to bring the project to fruition. The co-chairmen would like also to record their gratitude to Helen Heffernan for her initiation in the undertaking, her unremitting interest and comprehensive guidance of the project as it progressed, and final preparation of the material.

Special appreciation is due to Dean Orahood, Past President, Association for Outdoor Education, Co-ordinator of Outdoor Education, Norwalk-La Mirada School District, and Elwood Mitchell, President, Association for Outdoor Education, for their continuous and unstinted assistance in the project. The co-chairmen also appreciate the many hours of production work spent on this issue by Mrs. Betty Nogash and Mrs. Angela Manolakas.

WATER CONSERVATION TAUGHT BY OUTDOOR EXPERIENCES

MAYBELLE DE MAY, *Youth Services and Camping Section, Los Angeles City School Districts*

Outdoor schools may offer city boys and girls a unique opportunity to have close personal contact with a relatively undeveloped natural environment, an opportunity which gives them numerous advantages. They may gain insight regarding natural phenomena such as weather changes and plant growth. They may also acquire information regarding some of the problems involved in securing the water needed by a community and learn how erosion and floods may be prevented.

The camp for an outdoor school is in reality a small community that has many of the same needs as a city, including need for water and shelter. While boys and girls are living in the camp they can learn how certain of these problems are solved on a small scale and may then build upon this foundation understanding of how the same problems are solved on a large scale by California cities. The basic needs and processes are the same in each instance.

At Clear Creek Outdoor School, campers explore the source from which the camp gets its water supply. Most of them take hikes through the neighboring canyons where they observe differences in temperature and plant growth. They also visit the Big Tujunga Flood Control Dam. These experiences form a basis for understanding the occurrence and effect of water in the natural environment and its use and control by man.

Camp counselors must be skilled in leading boys and girls to observe facts and make discoveries. This involves getting them to give particular attention to significant details in the natural environment. At Clear Creek Outdoor School the counselors accomplish this by preparing questions that can be an-

swered by making careful observations. Each boy and girl is encouraged to observe and to test the results of his observations to the point that he is certain that he understands what he has seen. The following accounts make apparent part of the learning experience boys and girls have during a week at Clear Creek Outdoor School.

Where Does Water Come From?

At Clear Creek Outdoor School, the campers can see the whole process involved in getting water from its source to the points of utilization for community purposes. There are no missing or hidden parts of the story. The campers hike to the spring that supplies the camp with water, a hike which takes them through chaparral and a dry watercourse. Just when they are about ready to call it quits, they find the water tumbling down over the exposed bedrock. Some groups measure the flow. They use a sheet of plastic to channel the water into a gallon jar. They measure the number of seconds it takes to fill the gallon jar. Then they calculate how much water the source supplies in 24 hours and are surprised to find it is so much. When they are told how much water is needed for the average camper, they then estimate the adequacy of the water supply.

The stream flows into a large sand filter—the spreading area. As they observe this area they discover how leaves and debris are left behind as the water sinks into the sand. They see the dam that rests on bedrock and holds the water in the spreading area until it is collected. They learn that perforated pipes are located under the sand to collect the water which flows into a collecting tank. They discover that the bottom of this tank is covered with a fine silt that settles as the water flows into the tank. They also discover that the water for the camp flows from a point that is high enough above the one from which the water flows into the tank that it doesn't contain any silt. They also discover that by taking water from this point that there is no continuous flow through the tank and that the silt sinks as a result of this condition. The pipe line

through which the water flows to the camp is easily followed since it is on top of the ground.

The collected and filtered water flows into large storage tanks above the camp. As the boys and girls examine the tanks, they see the inflowing water, the outgoing pipes that lead to the camp buildings, and the overflow pipe. They can be sure that their estimate of the water supply was nearly correct because a surplus of water is flowing from the overflow pipe. Thirsty hikers can be refreshed here, for this is the same water they have in camp.

Following the water pipes down the hill, the boys and girls see the swimming pool, which also serves as the fire suppression reservoir and learn that it is filled from the source they have been exploring. They also learn that the water in the pool must be treated to keep it sanitary. In camp they have running water in the kitchen, drinking fountains, showers, and restrooms. All these facilities are supplied from a small spring on the mountainside.

The boys and girls learn that even spring water comes from rain and snow. They also learn how shrubs and ground litter stop rapid run-off and hold water sufficiently long for it to soak into the ground. They also learn that the water then flows underground until it is forced to the surface by impervious bedrock and bubbles forth as a spring like the one above camp. In these ways they are able to understand that if the watershed area above the spring is abused, or eroded, or burned off, the water supply for the camp will be adversely affected.

Soon the boys and girls are aware that there is no other way to get water than from rainfall and that every city, large or small, gets its water from a watershed somewhere. They learn that activities of the lumberman, the miner, and the careless smoker are therefore the immediate concern of every city dweller. From a study of the development and care of the camp water supply, the boys and girls can see in miniature the water problem of even the largest city. They can come to know that behind each drop of water they draw from their

faucets at home somewhere there is a bit of watershed that caught the raindrop or snowflake and made it available for their use.

How Does a Stream Change the Environment

Another day the campers plan a hike to explore Clear Creek Canyon. Their purpose is to find the different kinds of plants and animals that live in and near the stream and to enjoy their lunches under the trees of the canyon.

In planning the trip with the boys and girls, a short discussion brings out the idea that there is likely to be a climatic difference between a steep-sided moist canyon and a dry, sunny hillside. This climatic difference and the ready availability of water will be an important factor in the lives of the canyon animals and plants.

As the group hikes through the chaparral toward the canyon, the counselors ask different members to describe the shrubs they see. This helps all to learn to distinguish the different plants and shrubs by their appearance, feel, and smell. All notice how the shrubs are adapted to conserve water, how their leaves are spiny, leathery, or covered with dense hairs, and how tough and scratchy the wood is. The group watches for evidence of animals in the area. Frequently a raccoon has used the trail, and often several deer have crossed it. The deer have browsed the holly-leaf cherry heavily. The counselor shows how the tracks tell whether the animal was in a hurry and which way it was going. Often members of the group try to guess why it was using the trail.

Entering the canyon, the boys and girls feel the marked differences in temperature and humidity. They notice that the plants and trees are decidedly different from those in the chaparral. As before, they are encouraged to describe the plants they see. They observe that the leaves of the maples are broader and thinner than the leaves of any chaparral shrub. They feel the soft, smooth leaves of the tiger lilies.

A small clear stream flows in the bottom of the canyon, bubbling over rocks and splashing into pools. The water striders

skip over the surface, and newts crawl slowly over the bottom. A footprint in the sand shows that deer had been there. The boulders are smooth to touch, polished by tumbling in the stream bed and by the sand carried in the running water.

As the boys and girls enjoy the moist canyon area, the counselors help them to understand why so much water is necessary to city gardens. The colorful flowers and lush green plants the people like to see are those that thrive in a water-rich area like this streamside. In the hot, open plains of Los Angeles County, men must make up the difference between the natural rainfall and the water needed by the moisture-loving plants in their gardens. This is one of the ways men use water to change the environment to their liking.

Why Are Dams Necessary?

Southern California is subject to sudden downpours that produce a great deal more water than the land can absorb rapidly. When this happens, floods occur in the canyons and valleys. The San Fernando Valley is covered with sand and rocks washed out from the mountains in these floods, as are the plains all along the base of the San Gabriel mountains. Over 30 years ago plans were drawn to control and channel the storm waters so that the valleys could be used for homes and gardens. A series of dams now impound the flood water temporarily, and cement-lined ditches direct the waters to spreading areas. The flood control system also stabilizes the yearly stream flow and provides recreation in some areas.

Most of the boys and girls who come to Clear Creek Outdoor School have explored a dam, but all welcome the opportunity to visit the one in Big Tujunga Canyon. Before they leave on their hike, they talk about how a dam must be shaped to withstand the water pressure, how it must be anchored in bedrock, and what would constitute a good dam site. This gives the counselors opportunity to help them clarify their ideas and learn the new words needed to express themselves.

When the group reaches the dam, all are usually surprised by its tremendous size. The dam is very tall and appears slender as it crosses the narrow canyon from one side to the other. In spite of the fact that the children have studied about dams, have talked about them, and have seen pictures of many of them, they are still awed when they see this one in reality. For some, it will be an experience in personal daring to venture out on top of the dam even though the top is eight feet wide and has railings on either side.

The boys and girls gather by the control house to meet the director of the Big Tujunga Dam. The counselors review the necessary safety precautions and define the limits of the area to be explored. Then the campers are given time to walk across the dam to observe its great height and feel its massiveness. They look at the water level behind the dam, the spillway, the water stream jetting out through the dam, and the various controls and gauges. The teacher and counselors move about with the various groups listening to them discuss their observations and answering any questions the members of the group ask.

After their period of exploration, the boys and girls gather in a group to hear from the director how the Big Tujunga Dam was built and how it is used to maintain the water table for the cities of Sunland and Tujunga. He tells them its dimensions, how much it cost, and how much water it holds. He also explains the problems of maintaining the effectiveness of the dam. The boys and girls learn that erosion causes silt to fill in the storage area, and that this makes it necessary to keep the watershed area unburned and in a healthy condition, and that good natural damsites are rare in this area. They also learn that there must be sound bedrock to tie into, a narrow canyon so the dam doesn't have to be too large and expensive, and a wide enough canyon upstream to hold a great quantity of water.

Members of the group learn that a great deal of planning, engineering, and money are necessary to build and maintain a dam, and that a good damsite is a natural resource that they can conserve by protecting the watershed above it. They un-

derstand that the dam and other flood control measures make many square miles of land available for human use.

The story of water—either too little or too much—and the efforts that have been made to equalize the supply have been an important part of the development of our country. Boys and girls who have had these firsthand experiences in Clear Creek Outdoor School have a better basis for understanding the problems involved than others of their age who must get such information by other than direct means. The problems of supplying and controlling water must be of continuing concern to urban populations. Wise development and use of water and the need to preserve watershed areas must be understood by all people.

Enjoyable hikes at Clear Creek Outdoor School have provided opportunity for teaching boys and girls the role water conservation plays in the welfare of all. The boys and girls have seen the difference between a water-rich and a water-poor area. They have seen how water is obtained and how water is controlled. They have learned the interrelation between the bedrock, the topography of the land, the climate, and the vegetation, and how all these affect the water resources. They have acquired a background for understanding that all resources are limited and that people can exploit or conserve their environment, but cannot live beyond its resources. The firsthand experiences of Clear Creek Outdoor School help to increase the pupil's understanding of the need to conserve not only water but all natural resources.

THE NEVADA COUNTY PROGRAM OF CONSERVATION AND OUTDOOR CONSERVATION

MRS. MARGARET J. KELL, *General Supervisor of Instruction and Co-ordinator of Curriculum*, and DELTON PHARIS, *Supervisor of Instruction, Office of the County Superintendent of Schools, Nevada County*

Residents of Nevada County have been working for many years in a conservation program that was started by members of the U.S. Forest Service stationed in the area and members of the staff of the county superintendent of schools. In 1955, the original effort was extended to provide for concentrated effort to further conservation education through programs offered by the schools in the county. Since that year, the conservation education program offered by the schools has grown to such magnitude that keeping the program co-ordinated poses a major responsibility.

A conservation council with 30 members has been organized to help the schools and their communities to meet this responsibility. The membership of this council includes the county superintendent of schools, the curriculum co-ordinator for the county, representatives of the U.S. Forest Service and the State Department of Fish and Game, the county agricultural agent, a highway patrolman, businessmen, ranchers, school personnel, doctors, and lawyers. The council meets regularly throughout the year. In addition to performing its original duties, the council has extended its activities to include care and supervision of a ten-acre tract of land that is used for camping and outdoor education. It has also been influential in the development of fishing areas in the two main towns of the county which children can use in safety, and in the establish-

ment of a committee to help the schools select and develop school sites.

The purposes of the Nevada County Conservation Education Program follow:

1. To provide for good conservation practices to be understood and employed
2. To encourage the use of the outdoors as a classroom in which pupils may have firsthand experience in conservation
3. To provide pupils opportunity to learn about products of nature and to work with these materials in meaningful situations
4. To provide opportunity for pupils to explore their interests in the outdoors
5. To make available to the schools personnel experienced in solving conservation problems in practical ways
6. To improve the appearance of school grounds and to encourage full use of school grounds for outdoor educational purposes

The County Conservation Council furthers its purposes by carrying out the following activities:

1. Choosing an annual theme for the conservation education program offered by the schools
2. Visiting schools and classrooms to observe the conservation education programs in action
3. Making seedlings available for pupils to plant on the grounds of the schools
4. Supplying valuable trees for beautifying school grounds
5. Awarding plaques to schools and certificates to individuals for outstanding work in conservation education
6. Arranging and conducting "show-me trips" to observe conservation practices and the results obtained from them

Planning for co-ordinating conservation education activities starts in the County Conservation Council; next there is planning by the teacher and pupils, and the teachers consult with experts regarding conservation problems with which they need help. The program for each school is carried on largely through conservation projects. These are sometimes carried on by individuals but mostly by classes. They cover a wide range of problems in conservation and are conducted so that the pupils will understand the problems and be capable of helping to solve them. The activities required in completing the projects include making working models and dioramas, producing plays, art work, making oral reports and presentations, and writing articles on conservation.

Several important outcomes of the program deserve mention. School grounds have been beautified and are kept in good condition. Pupils have learned to use many materials creatively, to seek advice from individuals in the community who are well informed in their respective fields, and to use all resources of both school and community to good advantage. Interest in conservation has grown tremendously. The practical learning experiences have resulted in many pupils doing improved work in all their school subjects. These facts are clearly illustrated in the following reports.

Improvement in a One-room School

Mrs. Loveta Hornsby teaches all eight grades of the school in Washington District. She plans conservation study for the following purposes:

1. To provide opportunities for the pupils to plan, assume responsibility for and enjoy permanent improvements in the school area
2. To provide opportunity for pupils to grow things and see them develop
3. To improve the appearance of the school grounds

Plans were made for improving the schoolgrounds. Trees, shrubs, climbing roses, bulbs, annuals, and perennials were

planted and cared for by the pupils. Each pupil had an area that was his responsibility. A combination barbecue and incinerator was built on a cement patio and outdoor tables were added.

Previously the school grounds had been in bad condition and always littered not only by the pupils but by adults including campers and fishermen. The attitude of the community is now so protective that almost no problem of abuse or litter exists, yet more people use the grounds than ever before. The pupils show definite gains in their understanding of the practical aspects of plant care. They have an abundance of flowers to use and to give away. The attitudes of the pupils and others toward the school property have changed from a complete lack of interest and indifferent acceptance of abuse to one of social responsibility as shown by tangible results in improved school property. The pupils are interested in growing things and caring for them. They feel the schoolground belongs to them and accept full responsibility for its care.

A Three-teacher School Creates a Nature Area

Ready Springs Elementary School has three teachers [1] and 70 pupils in grades one to six. The school has four modern classrooms on a ten-acre site. During the clearing and leveling of the land prior to construction an acre of wooded area was left in a corner of the grounds. When the building was completed and occupied the staff started to develop this plot into a nature area.

The three teachers considered the general development of the area and broached the possibilities to the pupils. The pupils met the challenge with enthusiasm. The project began to take form as the pupils discussed various things they could do in this area to show good conservation practices. Their conversations and decisions were generally based on information that had been gained from reading.

The pupils knew a great deal about the native mammals. However, they read to learn even more about them and thus

[1] Louie A. Smith, Principal, Mrs. Edna Hutsenpillar, and Lillian McIntyre.

became quite expert on deer, rabbits, skunks, squirrels, woodchucks, moles, and gophers. At least one-fourth of the pupils made birdhouses and hung them in the trees.

The area abounds with various wild plants. The pupils decided to study and to identify some of these. Nature observation plots three feet square were established for every two pupils to observe and study. These teams observed, identified, and recorded the development of their plots during each of the seasons. Some of the pupils got great satisfaction from creative writing while others pursued various other forms of artistic expression.

The county is extremely rich in resources for those who enjoy mineralogy and geology. Many different kinds of minerals and crystal formations are found in the area. The pupils planned to collect and display mineral and rock specimens found in the area.

Because the wooded area of this region is almost entirely made up of broad-leaf oaks, the pupils are concerned with planting other native varieties on the school grounds. Stabilization of the soil on a barren bank near the school will be the purpose of a future project.

The pupils have expressed great interest and enjoyment in taking visitors through the area explaining the meaning of each phenomenon found. They have identified these with cards on stakes stuck into the ground and have developed a written guide to explain each object of interest along the nature trail.

The pupils have become "litter bug" conscious. It is unusual to find scraps of waste on the school grounds. The teachers no longer have to take major responsibility for maintaining the appearance of the school grounds. The children have assumed a major share of this responsibilty.

The natural area has become a population center for many varieties of birds. As a result, the boys and girls are requesting books on birds. If a person is alert as he progresses through the nature trail, he will notice scraps of bread, fruit, and other food that is attractive to birds and animals placed strategically

on posts, between branches, and in holes of tree trunks. Bird feeders and fountains are kept filled by the pupils.

Motivation for science in the classroom due to this project is assured. While conservation was the initial motivation for this project, a much deeper psychological motivation now exists. Pride in their environment provides the pupils with intrinsic motivation.

Especially in the small schools, the pupils and teachers have developed more self-respect. Pride and a feeling of responsibility for the care of school grounds and school property has been much in evidence. Pupils, teachers, and parents appreciate the creative use of the materials and resources of their school environment both in the building and the outdoor area and are growing in understanding of the responsibility everyone shares for the preservation and wise use of our natural heritage.

SAN BERNARDINO COUNTY'S CONSERVATION PAINTING FESTIVAL

Mrs. Carol R. Poppett, *Co-ordinator of Art Education, Office of the County Superintendent of Schools, San Bernardino County*

The San Bernardino County Annual County-Wide Spring Conservation Painting Festival is conducted as an integral phase of the conservation program carried on by the public schools in the county. The festival is conducted as a project which gives pupils opportunity to display graphically what they have learned about conservation in a correlated program of social studies, science, conservation, and art. Since 1949, classroom teachers, art supervisors, consultants from the office of the county superintendent of schools, parents, members of conservation agencies, local businessmen, and officials of the National Orange Show and the San Bernardino County Fair have co-operated in promoting this project.

Briefly, when pupils learn about conservation, develop wholesome and constructive attitudes toward conservation, and employ desirable conservation practices, they find it satisfying to express their ideas graphically through the use of paints, crayons, charcoal, pencils, or other suitable art media. By providing pupils instruction in art they have the necessary skills with which to express themselves, and by correlating art with social studies, science, and conservation, pupils are motivated both in their study of conservation and in the acquisition of the art skills essential to expressing their ideas regarding conservation.

Every pupil attending the public schools in San Benardino County is encouraged to present in a painting, watercolor, crayon sketch, or drawing an idea regarding conservation which he believes to be exceedingly important for school or local community exhibit. Each creation is mounted on a 22 x 28-inch

panel with the name of the pupil, the name of his school, and a suitable caption on the lower part of the panel. The caption usually is a brief phrase, theme, or statement of the pupil's conservation concept such as "Fire Destroys our Resources"; "Animals and Plants Need Each Other"; "Water Means Life"; "Clean Waters"; "Industry Wants Clean Air." Pupils produce their art work throughout the school year whenever they have the required art skills and ideas they wish to express.

The pupils' productions are judged at the festival and the best ones are displayed at the annual National Orange Show, the county fair, the Little Gallery in the office of the San Bernardino County Superintendent of Schools, and in local business houses.

Participation in the project is encouraged by awards for outstanding work being presented to the pupils' classrooms or schools rather than to individuals. The awards are usually useful and consist of needed science equipment or instructional materials for the classroom or the entire school. The number of illustrations produced annually has increased from several hundred to over 8,000. However, available space limits the exhibit at the orange show and county fair to about 500 items. Since 1956, pupils from kindergarten through junior college have participated in the project.

The Conservation Painting Festival has attracted the interest and support of all the communities in the area, the state and national agencies with special responsibilities in the field of conservation, parent teacher associations, business firms, and industry. The festival is truly a county-wide project. The festival has resulted in pupils understanding conservation and taking steps to further conservation practices, the public being alert to the need for conservation, and public pride in conservation projects and school activities being stimulated. The festival has in many ways proved to be a means of developing responsible citizenship.

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AN ALL SCHOOL OUTDOOR EDUCATION PROGRAM AT THE UNIVERSITY ELEMENTARY SCHOOL

JOHN D. CUNNINGHAM, *Supervisor of Science and Outdoor Education,* and OLGA RICHARD, *Supervisor of Art and Industrial Art, University Elementary School, University of California, Los Angeles*

Outdoor education includes those educative experiences which are best provided outdoors rather than in a classroom. It includes all learning that is furthered in the outdoors regardless of whether the child stays in an outdoor school overnight. Its subject matter may therefore include more than that from the fields of conservation and science.

During the past several years the staff of the University Elementary School has been studying the feasibility of making outdoor education an integral part of the elementary school curriculum. A sixth grade outdoor education program has been conducted by the University Elementary School for a number of years in various locations such as Catalina Island, Death Valley, and the San Bernardino Mountains. Beginning in 1958, however, a plan was initiated to broaden and co-ordinate the outdoor education program at all grade levels. The purpose of this was threefold: (1) to investigate the feasibility of outdoor education programs at all grade levels; (2) to demonstrate that successful outdoor education programs can advantageously be conducted in various types of areas; and (3) to illustrate ways of integrating outdoor education experiences with other aspects of the elementary school curriculum, particularly with the social studies, art, and science programs.

INCREASED WORLD AWARENESS THROUGH OUTDOOR EDUCATION

Among other things, the curriculum of the elementary school is designed to assist the child to understand his community,

state, nation, and the world, including its peoples. The curriculum is based on the assumption that children need to understand the way man utilizes his environment to fulfill his basic needs for food, shelter, clothing, tools, and the like. One method of accomplishing this aim is to provide children with a wide range of experiences. This may be done by taking them on study trips to various areas and helping them to learn about the plants and animals they observe, their interrelationships, and their relationship to the physical environment. Perhaps more important, however, the children in learning about the environmental conditions acquire backgrounds which make it possible for them to understand the problems facing people living in areas of the kind to which the study trips are made.

Taking children to the "world" is not the problem that it might at first seem to be. In most of California, and particularly southern California, the "world" is within relatively easy reach of a majority of school districts. It is often possible within a few hours and miles to visit examples of almost every major type of area except a tropic habitat. However, not all schools are located where the conditions are equally favorable.

As one climbs a mountain it is generally possible to find conditions that duplicate those found in thousands of miles of latitude. In many instances it is possible to travel from a grassland or desert at the base of a mountain through the brushlands to a mixed woodland, then through a coniferous forest, and finally above timberline where arctic conditions prevail. Thus, in traveling from the base of a mountain up to 6,000 or 10,000 feet of altitude, one finds life zones similar to those that may be found in making a 5,000-mile trip from the Mexican deserts through the grasslands and forests of the United States, the coniferous forests of Canada, and the arctic regions of the north.

The distribution of biotic areas are given by Odum[1] and Kendall.[2] Russell and Kniffen[3] discuss the influence of the

[1] E. P. Odum. *Fundamentals of Ecology*. Philadelphia: W. B. Saunders Co., 1953.
[2] H. M. Kendall, R. M. Glendinning, and C. H. MacFadden. *Introduction to Physical Geography*. New York: Harcourt, Brace & Co., 1952.
[3] R. J. Russell, and F. B. Kniffen. *Culture Worlds*. New York: The MacMillan Co., 1951.

physical environment upon the people inhabiting each of the areas.

The University Elementary School Program

The University Elementary School provides every child opportunity to learn about the major biotic areas of the world. This is accomplished by an instructional program that contains the following provisions for pupils to participate in outdoor educational acitivities:

Nursery School, Kindergarten, and First Grade—community and school study trips, one day or shorter
Second Grade—ranch and farm camp, two days
Third Grade—desert camp, three days
Fourth Grade—beach and foothill camp, three days
Fifth Grade—mountain and snow camp, three days
Sixth Grade—Catalina Island camp, five days

At each grade level from the second through the sixth numerous other community and school trips are provided.

The University Elementary School is fortunate in being situated in a rustic setting within a metropolitan area. The grounds have been profusely planted with trees, shrubs, and flowers from many parts of the world and a small stream meanders through the grounds. This allows much outdoor education to take place with nursery school and kindergarten children through their walks and play in the gully area and their "hikes" to the redwood grove across the gully. The grounds also constitute an invaluable teaching resource for all grades in the school. Schoolground outdoor education would be enhanced if this potentiality was considered in all school site selection and in landscape planning.

In connection with their expanding community studies, children in the first grade take field trips into the outlying community. They visit such places as the harbor, airport, fire station, police station, theater, and supermarket. These are all trips of less than a day. The school camping aspect of the Uni-

versity Elementary School's outdoor education program commences with the second grade. The social studies units normally taught in that level are the Farm, the Bakery, the Dairy, or the Wholesale and Retail Market, all of which, in one form or another, deal with agriculture. Therefore, children in the second grade participate in a two-day farm and ranch camp program in which they have experience with animals and crops and the valley and grassland habitat.

Children in the third grade participate in a varied cultural studies program designed to aid them in relating life in several areas. The outdoor education program furthers the skills involved in making such comparisons. An entire day is spent at the beach studying the plants and animals at high and low tide. The children record their impressions of the ocean through sketching and painting. At the camping site in a canyon not far from the ocean is a fresh-water lake, allowing comparisons to be made between salt-water and fresh-water life. The surrounding chaparral-covered hills with patches of oak woodland constitute a transitional area between the valley and grassland habitat studied in the second grade and the coniferous forest habitat studied in the fifth grade.

The fifth grade program is conducted in early spring when there is snow on the camp grounds. In this mountain experience the pupils learn about the forest habitat and the snow provides opportunity for the pupils to have an introduction to arctic conditions. A forest setting is the environment of the Colonial America study and constitutes an area of major study in the Westward Movement social studies unit taught in the fifth grade.

The school camping program for the sixth grade is designed to review and expand previous learning. Children in the sixth grade often study aeronautics and the United Nations, both of which in different degrees deal with the need for all peoples to understand the cultures of the world. To accomplish this, pupils in the sixth grade participate in a five-day experience on Catalina Island. During their study trip on the island the

pupils have an opportunity to review many of the principles they have learned on study trips to grasslands, deserts, foothills, and ocean. And the heightened social concern of the pupils makes it possible to introduce many new concepts relating to their environment. Every attempt is made during the pre-camp, camp, and post-camp activities to expand the pupils' awareness from the immediate area to a worldwide view.

The outdoor education program is closely associated with the social studies program. However, there are also other bases for the program. Beginning with the first grade community studies, the child's understanding of his environment is gradually broadened. The site for the second grade farm program is within the metropolitan area. This seems appropriate as a location for giving the child his first group experience in school camping since much is familiar, and hence the child feels comfortable and secure. The desert camp is somewhat removed geographically. Here the child's attention is centered on desert natural history.

During the fourth grade experience, comparisons are made between habitats, i.e., the salt-water, fresh-water, and arid foothills. All of the experiences through this level have taken place in areas where the majority of the population of California resides. The natural history of these regions is more familiar to children than that of forest and arctic regions.

During the fifth grade experience, the dependence of the people of California on mountains and snow can be made clear. Children in the sixth grade visit a varied environment which provides examples of several areas and provides for consideration of the worldwide distribution of habitats and people.

In the University Elementary School program all camp teaching is done by supervisors and student teachers. Occasionally when it is impossible for student teachers to accompany a class to camp, outdoor education students from the University are utilized. This results in practical outdoor education techniques and subject matter becoming a part of the training of most student teachers at the University Elementary School. A sufficient

number of pre-camp sessions are held to familiarize the teachers with the camp situation; planning for the camp is done in post-camp sessions. Camps are generally leased with provisions for food, cooks, and maintenance personnel, relieving the school staff of arranging for those aspects of the program. The entire cost, other than the salaries of the regular school staff members, is assumed by the parents of the children attending the camp.

The subject matter of outdoor education is drawn entirely from the environment. In the science and art activities an attempt is made to delete from the program everything that can be accomplished in the classroom. While some equipment such as thermometers, geology picks, magnifying glasses, microscopes, nets, traps, trowels, and craft tools is taken to camp, the usual classroom materials are left in the classroom.

The recreational skills of outdoor education, such as campfire building, cooking, and fishing are largely excluded from the program. Included, however, in the activities are such studies as astronomy (which is impossible in the usual elementary school science program) and the trapping of animals.

Science and Outdoor Education

Science, in its broadest sense, is the basic outdoor education subject matter. While much science, particularly that dealing with experimentation in the physical sciences, can most effectively be taught inside, other aspects of science are sterile of meaning when taught in the classroom. The teaching of such topics as weather, geology, animal behavior, the variety and distribution of life, conservation, and astronomy entirely indoors is not as effective as it should be. While it is often necessary to teach outdoor subjects indoors, it is frequently possible to make greater use of the schoolgrounds as a resource. The teaching of certain subjects outdoors eliminates the need for bringing into the classroom cumbersome and often expensive and complicated apparatus.

No amount of reading, watching movies, or discussing the effects on loose soil of wind and water, the flight of birds, form

and color in nature, to mention a few examples, can duplicate the outdoor experiences of observing these things. It should be emphasized that a complete elementary school science program cannot exist without major use of the physical environment through schoolground exploration, field trips, and school camping programs.

As the population increases, the landscape changes rapidly and profoundly. Within many school districts it is becoming increasingly difficult, or even impossible, to find river beds, vacant lots, marshlands, and other types of natural areas. If it is educationally important for children to know something of their physical environment, to comprehend space and time, to understand change and the interaction of natural forces, outdoor education cannot be considered a curricular frill.

Every society and culture, past or present, has had its base in the resources available to that culture. Our culture has been richly endowed with resources, both physical and human. Many of these resources have been exploited. Understanding the interrelationships between man and his resources is crucial to the survival of both society and the natural environment. Outdoor education can contribute heavily to pupils' understanding of these facts.

Conservation is not taught as a separate, formal subject at the University Elementary School. Rather, it is a basic ingredient of much of the science and social studies program. It is taught by helping the child to see and interpret his surroundings and to understand the interrelationships of all things and forces. Through the method of outdoor education it is possible to accomplish this historically and geographically by studying several peoples and environments. Understanding conservation as a result of rich outdoor curriculum experience is more meaningful than it might be otherwise.

Art in the Outdoor Education Program

The University Elementary School outdoor education program utilizes on-the-spot painting and sketching as a basic

method of helping pupils to understand and synthesize the myriad of sensory images received. Art experiences in the general school curriculum serve many functions such as: (1) providing for self-expression; (2) stimulating visual creativity; (3) developing technical understanding of art materials; (4) increasing empathy with other subject areas; (5) providing therapy; and (6) preparing for leisure activity. Most of these functions draw from vicarious experiences and rely heavily on the child's memory and imagination rather than on specific and careful observation.

Art experiences in the outdoor education program serve a qualitatively different function—that of recording the environment with scrupulous attention to detail. When the child looks, learns, thinks, and draws or paints he notes shape, line direction, size relations, and similarities and differences. In the camping program, all experiences are planned toward the specific goal of heightening acuity. With this emphasis on recording through drawing and painting even young children depart from the schematic trees utilized so frequently in the classroom and replace these "lollipop" forms with carefully observed and honestly executed impressions of well-understood plant growth. It is in reference to this goal that the visual arts are used as a basic method of furthering observation and recording.

Natural history learnings may be enhanced by providing each child opportunity to record his observations. This recording focuses, intensifies, strengthens, and reinforces the experience. Seeing and listening can be merely optical and auditory signals outdoors as well as indoors unless each child can identify the uniqueness of the signals. Providing opportunities for the child to explore his environment is not enough. The child needs to communicate what he discovers. The graphic arts provide him with a means that he can use successfully for this purpose. Through personal identification and translation, the panorama of tree, bird, mountain, wind or sea is better understood and more lasting in significance. Through communicating and mak-

ing a concept real to others, the child relates his initial sensory response to his intellectual understanding of the subject.

Science and art share similar goals in the outdoor education program—to unify the child's visual and sensory experiences with his intellectual understanding and to help him grow in the skills necessary to communicate his understandings to others.

In the outdoor education program the child uses water colors, pastels, crayons, chalk, or charcoal pencil to make on-the-spot records. These records show in the following ways what he has gained from his observations: (1) by depicting the main features of the dominant masses such as the quality of sky, hills, distance, mountain ranges, color changes, and shapes and forms distinguishing the landscape; and (2) by making the infinite variety of detail observed apparent through pictorial records made with pencil, chalk, charcoal, or crayon.

The outdoor education program stimulates art expression. Firsthand experiences are vital to creative perception and insight. Creative art does not seem to flourish in an atmosphere of vicarious experience. In painting what he sees around him, the child responds to the forms and masses and formulates methods of translating this response to the flat dimension of paper so others share in some of the same visual sensations.

Teachers assist children, not by drawing for them, but by pointing out the unique characteristics of the environment—directions of growth, differences between one tree and another, trunk textures, color masses of heavily wooded areas, shadows on snow, and distances on the desert. The phrase most used by teachers in this situation is "Let me help you look." These art experiences supplement the science program to the extent that they utilize the subject matter of the whole experience, personalize it, and focus it into meaning for each child. Visualizing and communicating through painting and sketching become component parts of comprehending. Art utilized in this manner is challenging to the child and sensitizes him to meaningful visualization.

The choice of camp sites and habitats, predominantly influenced by the pattern of social studies units, makes for a gradually increasing demand in acuity of observation. The effects are, it is hoped, cumulative. For example, the curriculum in the second grade is designed to expand the child's understanding of specific community needs in contemporary life. In these studies short visits are made to dairies, orchards and other agricultural centers. A suburban agricultural area is revisited in the camping experience. Enough time is allowed to explore it in detail. Drawing and painting is utilized to encourage observation beyond the cursory into the infinite detail and specificity of the area.

The third grade desert camp is considerably removed from the school and provides what at first seems to be a dull and boring landscape with repetitious bareness but which upon closer scrutiny becomes one replete with variation in plant growth, shapes, textures, shades and colors. Because the landscape is far removed from the familiar shapes of the urban area, the desert panorama is essentially one of discovery for the child.

The fourth grade camping experience at the beach challenges the child to interpret and compare—the ocean with its combined horizon-to-horizon span of water and sky as contrasted with the lake surrounded by foothills.

The fifth grade camp expands upon its study of pioneer life by moving into the mountain and forest environment. The specificity of tree growth along miles of ridges covered with snow is a dramatic panorama. These experiences gained in this environment are synthesized in the sixth grade camping experience at Catalina Island.

CHILDREN BUILD A NATURE TRAIL IN MONTEREY COUNTY

EDWIN LEACH, *Co-ordinator Conservation, Outdoor Education and Science, Office of the County Superintendent of Schools, Monterey County*

Educators, particularly specialists in outdoor education, have believed for a long time that outdoor science and conservation experiences should be offered children at all grade levels. The Washington Union School District, which sends its sixth grade pupils to participate in the Monterey County Outdoor Science and Conservation Program, recently started building a nature trail on school property that will be used to provide outdoor science and conservation education for all its pupils—250 boys and girls.

The Washington district is located midway between Monterey and Salinas and three miles east of the Salinas-Monterey Highway. The school building, constructed in 1954, has many of the modern features of other schools in Monterey County. The natural features of the site on which the school is situated are, however, outstanding for outdoor study. The school building stands parallel and adjacent to Toro Creek. The area along this creek abounds with many plants and animals. On the side of the creek opposite the school there is a large playground with a baseball diamond and blacktop basketball courts. Beyond the playground and extending up the side of a hill are five acres of oak-studded woodland. This part of the site is not suitable for buildings or playgrounds but is valuable as an outdoor school.

Herman Rigmaiden, the superintendent of schools, conceived the idea that such use might be made of this area and discussed the possibility with Robert Nixon, the eighth grade teacher; Monte Ballou, a naturalist who lives in Carmel; and the science consultant from the office of the Monterey County Superin-

tendent of Schools. All agreed that the potential of the area for outdoor study was great. Their conclusion was that a nature trail might be developed along the creek and through the natural area and used to enrich the educational program of the school. The following outline was made of the policies that would be followed in building the trail:

1. The nature trail was to be designed to allow maximum use by all children in all grades.
2. Much of the trail planning and development was to be done by the children with teacher guidance.
3. The trail was to be constructed to permit easy observation of many different plants.
4. All dangerous objects, including poison oak, were to be removed for a safe distance on either side of the trail.
5. During construction all workers were to keep in mind good conservation practices and do all they could to keep the destruction of plant life and animal habitats to a minimum.

Mr. Ballou and the science consultant explored the area and marked a route for the trail. The trail followed a course that was planned to permit pupils and others visiting the area to see most of the interesting products of nature. The trail was then graded during recess and lunch periods by pupils in the eighth grade. This took less time than was expected since the winter rains had made the soil easy to work. Large logs, brush, and poison oak were removed by the custodian. At steep spots the pupils dug out the ground to make steps. They faced these steps with boards so that the steps would not deteriorate rapidly either from use or weather. Many parents were surprised to find that the children considered the work to be fun.

Another phase of the project, perhaps the most important one, was to decide how the nature trail was to be used. This was decided after the published materials on nature trails kept in the office of the county superintendent of schools had been studied. Mr. Ballou, the naturalist, labeled many of the amazing

and hard-to-recognize plants. Educationally, it was believed that many things should be left unmarked in order to stir the imagination and curiosity of those who used the trail, and that the users would then seek the desired information through exploration and study.

The pupils divided the plants and birds to be investigated equally among themselves. For plants, the pupils listed such information as leaf patterns and whether the plants were deciduous or evergreen. In some cases they reported stories concerning uses that had been made of the plants by the Indians or pioneers. For birds, data such as habitats, behavior, and songs were recorded. The boys and girls worked hard to get the desired information for each plaque in exactly the form they wished to use. When this was done, they printed the information on heavy art paper with India ink. Next they glued the cards to the redwood plaques and painted several coats of spar varnish over them. Each plaque was placed beside a good specimen of the plant described. The plaques for birds were made most helpful by displaying on each one a colored picture of the bird described. These plaques were placed at points along the trail where visitors might best have their attention directed to the birds in the area.

The trail is now open. Mrs. Stull's kindergarten was among the first groups to travel the 150-yard long lower trail. The children could not read the plaques but they enjoyed listening to their teacher tell what the signs said. Many of the questions on the plaques are not too difficult for five-year-olds to answer. When Mrs. Stull takes the children in her class outdoors to observe seasonal changes or the first flowers of spring, they can now follow a real trail, one that belongs to their school.

All the teachers will utilize the trail as an outdoor classroom in which pupils have opportunity to learn firsthand about the natural environment. The new teachers, who are not familiar with the area's natural features will find the information on the plaques especially valuable.

The interest of the community in the project has been gratifying. The local garden club, for example, is augmenting the trail by donating trees and shrubs native to Monterey County. This will allow the children to have additional experiences, such as determining the names of native trees and under what conditions they grow best. Many groups have used the trail. Scouts, classes from other schools, and adult groups have found the trail provides both profitable and enjoyable experiences.

The trail is not completed and perhaps it never will be. An upper trail will be completed in 1960 bringing the total trail length to approximately 500 yards. Mammals, reptiles, amphibians, geology, and other subjects will be given the same attention as has been given to plants and birds. As these additions are made, the children will be gaining an increasingly deep appreciation of the type of community in which they live. The science curriculum offered by the school will be enriched as the outdoor classroom is improved.

Louis Agassiz, the great nineteenth century Swiss-born American naturalist, once said, "Study nature—not books." Reading materials are more numerous and accessible now than in the days of Agassiz so his words might be altered just a little to read, "Study nature—then books." Such a statement comes near to describing the intent of the Washington Union Elementary School Nature Trail.

DANVILLE'S NATURE TRAIL

The Danville Union Elementary School District, Contra Costa County, according to Russell K. Grater of the Yosemite Field School, National Park Service, acquired several acres of wild land immediately adjacent to the school buildings. Included is a creek and considerable brush and trees. It was decided to use the property as an outdoor study area. A nature trail and study areas were planned for biology, ecology, and related subjects.

The outdoor education program is just beginning to develop. In Mr. Grater's words: "I spent one Saturday with 23 teachers doing a demonstration of how teaching can be done on the trail and discussing with them the scope of teaching possibilities in natural science and conservation. Other such meetings will help train teachers to utilize the materials contained in the wild area.

A small circle of logs has been placed at one point where an entire class can be seated while the teacher talks—or while the members of the class quietly watch selected objects in nature.

Mary L. Byrnes, Curriculum Director for Danville Union School District, lists the following objectives for the nature trail activity: (1) to make complete use of the school's natural resources and outdoor heritage; (2) to stress science concepts rather than discrete facts about nature; and (3) to emphasize co-operation above competition.

The following activities were carried out in planning the nature trail:

1. Teachers, principals, and members of the parent-teacher association met to decide how to utilize the creek flowing through the school property.
2. A teacher-pupil committee studied an established nature trail at a neighboring school to secure information regard-

ing ways their trail might be improved and used to best advantage.

3. Citizens informed regarding flood control gave direction on how and what to do in controlling flood waters and advised regarding what plants could be removed from the creek bed and replanted on its banks.
4. Mr. Edmund, a native-plant nurseryman in the community, helped the pupil-teacher committee to identify and label plants and advised what to plant and where. He also helped them develop a master planting plan.

The following activities were carried out in building the nature trail:

1. A central file of instructional materials on nature trails was established.
2. A star-gazers' circle of logs to be used in the summer science program was constructed.
3. Junior naturalists to provide nature trail service were elected.
4. The teachers and pupils planned for the work on the nature trail which involved most of the grades.
5. The pupils wrote periodic nature trail bulletins pointing out seasonal changes, bird migrations, and the like.
6. All classes planted wild flower seeds.
7. At Christmas each class bought an evergreen tree for the trail. Each class was responsible for planting, watering, and caring for the tree it provided.
8. Pupils in the fifth grade made the signs for labeling trees, plants, and interest areas.
9. Boys in the fifth and sixth grades assumed responsibility for putting up bird feeders and bird houses.
10. Pupils in the sixth grade made a scale map of the nature trail.
11. Pupils in the sixth grade erected a large bulletin board and painted at its top, Nature's Notebook.

12. Parents donated logs which were placed along the trail to be used as benches for outdoor classrooms.
13. Pupils in the seventh and eighth grades made a contour map of the area.
14. A teacher constructed a sign over the entrance to the trail.
15. Junior naturalists planted native trees and shrubs along the trail.

A SCHOOL NATURE TRAIL AND OUTDOOR LABORATORY IN EUREKA

Ray Cetina, Principal, Grant School, Eureka, describes how the pupils in the third, fourth, fifth, and sixth grades and their teachers joined forces in planning a combined nature trail and outdoor laboratory on four acres of natural woodland.

The project was initiated by the pupils in the fourth grade when they went to the area to plan for a "49'ers Day" as a culmination to a unit on California history. The trail and outdoor laboratory was planned co-operatively by the children, their teachers, and the principal. The actual work on the trail and classroom was done after school and on week ends with the help of parents. Both are used in a program in which conservation, science, and social studies were correlated.

Many wholesome attitudes were developed through this project. Most of the pupils learned to appreciate the natural beauty of the area and the importance of conserving its plants and animal life. Some also got a therapeutic benefit from their experiences. The latter was in large part the result of success enjoyed in constructing a facility in which the pupils saw values.

WOODWARDIA FIRE STUDY DEVELOPS VITAL CONSERVATION CONCEPTS

Mrs. Karen Elgin, *Fifth Grade Teacher, Paradise Canyon School, La Cañada Public Schools*

As the fifth grade boys and girls watched the smoke and tongues of flame lick down the mountain side above their school in La Cañada, they asked many questions about the fire, its probable cause and effect. The teacher saw in their questions an opportunity to launch a study in one aspect of conservation—forests and watershed.

The first step taken was to secure an introduction to the study that would be based upon the pupils' interest, especially those stimulated by the fire. This was accomplished by encouraging the pupils to make a list of all the questions they would like to have answered. The following list was developed:

What caused the fire?
How extensive was it?
What did it do to the forest?
Who fought the fire?
How did they fight it?
What damage was done?
Can the damage be repaired?
What will it all cost?
How will the fire affect us?

Captain D. F. Hooper, of the Los Angeles County Fire Department, had recently inaugurated the Junior Fire Department program with the class, and his second visit came just after the fire was controlled. His discussion of the fire, his answers to the pupils' questions about the fire, and the pupils' subsequent reading led the class to make important conclusions concerning (1) the cost of all operations and service of fire control; (2) the manpower efforts and the loss of life; (3) the terrific waste from a fire; (4) the fact that people easily forget a fire; (5) the new and vital vocabulary learned from the study; and (6) the animals' "point of view" after the fire.

In making these conclusions the pupils' curiosity was aroused regarding what it was like in the fire devastated area and they suggested that the only way to find out was by going to see. A study trip to the area was then planned.

Organization for a Field Trip

In planning for the study trip into the fire area, the class decided that before the trip was made, that among other things time should be devoted to studying (1) how soil temperature is measured; (2) variations of topsoil depth; (3) the composition of soil; (4) organisms in the soil; (5) effects of acidity or alkalinity on plant growth; and (6) how soil is held together.

After the class had completed this study, plans for the trip were completed. These plans included making a list of things to see, to test, to ask about, to collect, and to photograph. Ideas developed while this list was being made were written down by recorders selected by the class. The list and all ideas recorded were then duplicated by the teacher and a copy given to each pupil. Each child was given opportunity to decide the phase of the study for which he wanted to be responsible. Each was then given time to collect the equipment he needed.

A forest ranger accompanied the class during the first part of their exploration of the area that had been burned over. He answered questions asked by the pupils and directed the pupils' attention so that they made many important discoveries regarding the devastation caused by forest fires, and he helped the pupils to draw important conclusions regarding the need for employing intelligent conservation practices. The class was then divided into three groups and one group was assigned to the principal, one to a special teacher, and one to the regular teacher. Each group had an efficient photographer and a "floater" to tackle unforseen problems. A knob-cone pine seedling was taken on the trip for an official "tree planting" in the burned area. Studies were made of (1) the depth of topsoil in different areas; (2) the acid and alkali composition of the soil; (3) new growth; (4) splash erosion; (5) soil temperature;

(6) living things; (7) soil compaction; (8) air in soil; and (9) wind direction.

Post Trip Evaluations

Immediately after the field study trip and without class discussion, each pupil wrote his impressions, "finds" were shared, and material readied for later experimentation. Thank you letters were written and dispatched to all people who had assisted the pupils in any way.

The following questions were formulated by the class and then answers to the questions were sought through discussion:

1. What are the most obvious results of this fire?
2. What are the less obvious results of this fire?
3. What type of fire was it and how did winds affect it?
4. How did animals help or hinder the fire fighters?
5. What is a watershed?
6. How did the fire destroy the watershed?
7. What effects might this have?
8. How did the fire fighters get heavy equipment up the slopes?
9. Where did the water come from?
10. How are permanent water tanks filled? (in the mountains?)
11. How and where was the fire first discovered?
12. Was the soil burned? How has it changed?
13. If the soil did burn, can it grow plants again?
14. When the fire was out what was done first?
15. How could the exact fire area be mapped?
16. What happened to all the animals that were killed by the fire?
17. What are some ways the U. S. Forest Service will try to stop the bare soil from washing and blowing away?
18. Why did we get such large ashes and burned leaves falling on our school yard?
19. What seed was used to re-seed the area and why that seed?

20. Does a chaparral type ground cover make it easy for fire to advance quickly?
21. After fire weakens trees that are not entirely burned, what new enemy can come along to kill them?
22. If we have much rain, are there many steep slopes which will make the rainwater run off the land instead of soaking in?
23. How much ground cover is left in the fire area?
24. How much erosion has taken place?
25. How deep is the topsoil in the area burned over?
26. Are there new things beginning to grow? What are they?
27. Did the fire change the soil?
28. Is the temperature of the soil the same on burned and not burned areas? (both in shade and sun)
29. Can soil that has been subjected to great heat produce plant life?
30. What is meant by compacted soil?
31. What impresses you most when you visit the area of the forest fire?

A Report Is Prepared

After the study trip each child completed a report of his observations and of the experiment he conducted or participated in. All experiments were written up and posted on a chart rack. Some of the reports included explanatory charts. These reports along with others pertaining to the trip were placed on display in the classroom. The latter included topics such as germination after fire of sugar and coulter pine seeds; class impressions of fire area; equipment used in fighting the fire; a study of the burned chaparral area; analysis of seed pods that went through the fire; and a newspaper picture display of the fire.

Special attention was directed to a scale model of the Woodwardia Fire area. A group of three boys traced the two-, three-, four-, and five-thousand feet elevation countours onto an acetate overlay map. They used different colors for each level. Several patterns were made for each level on four acetate overlays, and on a fifth acetate overlay the peaks of all mountains

were located and identified. The acetate patterns were cut out and then used as templates for making tracings on a wood panel. The pieces outlined were cut out, coated with shellac, assembled in contour layers, and tacked together.

After some experimentation, a mixture of asbestos flakes and starch was used to shape land surface features. When the model was dry the fire area was outlined and painted brown and the unburned area was painted green.

The Angeles Crest Highway, Foothill Boulevard, and Gould Avenue were painted with red lines. Pin flags marked important points such as Mt. Wilson, Mt. Disappointment Lookout Station, Dark Canyon, and Paradise Canyon School.

The following poems were written by the pupils after they had made the study trip:

LOOK RIGHT NOW

Look right now,
In the Heaven of Hills,
Where the creatures live,
And the Flame Kills.

The deer are tame,
And the flame is wild,
The blood is red
And the deer is dead.

THE FOREST GREEN

The chaparral is beautiful
When you know what it means,

It stops the strong floodwaters
That kill the forest greens,

But when the fire destroys it,
It kills so many things,

The watershead, the bird song
The clearness of the springs.

Culmination Exercise

The study was culminated by a report to the parents. This report was made as follows:

PROGRAM FOR THE WOODWARDIA FIRE REPORT

Introductory music: *The Dove* from Respighi's suite *The Birds* tape recording:

Voice: This is one sound of the mountains (bird calls).

Voice: And this is a sound of the mountains (wind sounds).

VOICE: And this is a sound of the mountains (children talking about a picnic).

VOICE: And this is a sound of the mountains (running water).

VOICE: And this is a sound of the mountains (crackling of forest fire).

VOICE: FIRE!

NARRATOR: We are going to tell you about a fire, our fire!

POEM: A Flame-swept Tree

FIRST NARRATOR

It was October 16th and we were just getting out of school. Who saw the fire? (Class spontaneous responses all togther, such as, I saw flames up behind that mountain. I saw smoke, and the like.)

SECOND NARRATOR

It was indeed a fire. It raged six and a half days in Angeles National Forest, took the lives of two men and millions of animals, and cost the taxpayers lots of money. But it cost us a lot more.

THIRD NARRATOR

We studied the fire because it affects us in many ways. We are studying conservation and this fire ties into our study. We are also members of the Junior Fire Department. Captain Hooper came and told us about the fire and showed us films. Then we wrote to the Los Angeles County Fire Department asking for information we hoped they could give us.

FOURTH NARRATOR

Captain Hooper got busy and so did Mr. Corey. Captain Hooper's staff assembled a contour map of the Angeles National Forest fire area. This is it! It was composed of three quadrangle maps. As soon as the information arrived our project began. It was roughly divided into two parts: Part 1, transferring the

contour map into a scale model; Part 2, research and collecting facts.

When we decided that we would study the Angeles Forest fire, we also decided we would make a model of the fire area. Captain Hooper sent us this contour map made up of three quadrangle maps. So we traced the two-, three-, four-, and five-thousand feet elevation contour lines on to acetate overlays. Then we marked the part of the acetate we needed to trace contour patterns on plywood that Mr. Corey got for us. We then took our wood to La Cañada School where Mr. De Groot cut out the pieces.

After the pieces were out we covered the pieces with shellac. Once the shellac was dry, we assembled the pieces and tacked them together. Then we found and marked the peaks. We tried four different materials to see which one would work the best for making the mountains on our contour map. We found a mixture of asbestos flakes and starch was best.

Then Cam located the fire boundaries and outlined them in pencil. We painted the fire area brown and the rest in green. We outlined it in black. This model is the map transferred into the model. There are lines to show where the elevations are located on the contour map. On our model we used a scale of one-half an inch to 1,000 feet and showed the actual land surface features.

New Voice

While this was going on we had several class discussions. We decided to go on a field trip to the fire area. We found we could do some experiments. We had fun getting our jars and clip boards together. Each child had his own question or experiment.

Hilary

When the class came back from the field trip we all wrote up our impressions on what we felt like about the fire. When Mrs. Elgin graded our papers she found we had seen many interesting things.

Greg Wood made this book and put our stories into it. Some of the class made poems—this is mine (read it). When we went up to the fire area, some of the class found burned animal bones. Our school nurse helped us identify some of these bones. This is a back or vertebra bone. The little holes are where the veins go. The big hole is where the main nerve goes.

JIM

The fire not only burned the wood, it also burned the rock and soil. This is a half-burned and half-not-burned rock; here is a burned manzanita. Here is some topsoil and it's like hard black cement, and when the rain comes it won't have a chance to soak in. This is one reason for floods.

LINDA AND MARLYS

Linda and I found a chunk of burned soil. We looked at it under the magnifying glass and made a list of what we found.

1. sticks (burned and not burned)
2. a chunk of burned bark
3. burned oak leaves
4. burned rocks (some not burned)
5. burned pine needles
6. burned rolled up leaves
7. some flat leaves
8. sticks and thorns
9. sand and dirt
10. burned acorns
11. burned berries
12. charcoal
13. a seed not burned
14. skeletons of burned leaves
15. curled up burned bark
16. burned chamise
17. rabbit droppings
18. ashes
19. burned seeds
20. dead insects

JENNY

When our classroom was planting the pine tree I found some pine cones—this is the sugar pine and this is the coulter. The coulter and the knob cone pine only open their seeds after a fire. This is a log. It shows tree rings and you can tell how old the tree is by counting the rings. When the rings are close together,

the tree was growing slowly. When the rings are far apart the tree grew quickly, as in good years.

GREG

I did an experiment to find out if chaparral soil would grow plants. I put the soil in pots on January 29, 1960, and saw when I watered it that the water went through very easily. The chaparral soil is like a sponge. The soil did grow plants.

RUSSELL

I did the same thing with burned soil. When I watered it the water went through the burned soil slowly. (When the fire burns the soil it burns the things in the soil so it falls together and packs on top.) The result of my experiment shows that the chaparral will grow plants and the burned soil does not. We made a chart to show this. This is it. (Shows chart.)

TIM

My experiment is to show that the roots of the chaparral ground cover and the oxygen in the soil hold it together. But after a fire burns the roots of the chaparral ground cover it also burns the oxygen in the soil so it will fall apart and blow and wash away.

JEFF

I set out to see if a chamise plant will germinate after a fire. So I put a chamise plant on a wood slat. Then I put straw on top of that. I lit a match to the straw. It may not germinate because the conditions in the room are not like outdoors.

LINDA

Our experiment was to find out if burned soil changed. We first used vinegar and baking soda and tested them with red and blue litmus paper. The vinegar was acid and the baking soda was alkali.

JERRY

When we went on our trip we took samples of the soil. Linda took the burned soil and I took the chaparral soil. Then

we brought them back and put water in them and shook them up and let them set for two days. Then we put the blue litmus paper in the burned soil and it stayed blue. Then we put the red litmus paper in it and it turned blue. So that meant that the burned soil is alkali. Then we did the same thing with the chaparral soil and it showed acid.

JAN AND DEBBY

We wanted to find if there were any living creatures left in the soil. First we went on our field trip and got some burned soil. Then we came back to school and magnified it. After we magnified it we found that there were no living creatures left in the soil. This is because the fire burned everything in the soil.

CECILE

My experiment was to find out how many things were growing in one square foot of burned area after the fire. The planes dropped rye and mustard seed. But then a few days later a great wind came and blew it away. The ranger told us this. So very little grew.

JOHN

We set out to find the temperature in the exposed area and where it was not exposed. I took the ground temperature under the chaparral ground cover and in the burned soil. I took these temperatures with this thermometer by sticking it in the ground. (Shows metal ground thermometer.) In the chaparral in the sun it was 45.4 degrees; in the shade it was the same because the brush shaded out most of the heat. In the burned area in the sun the temperature was 51.8 degrees, in the shade, 46.40 degrees. The temperature in the burned area was 62 degrees F. Then I took the temperature in the chaparral and it was 59 degrees F. I took the temperature every 15 minutes.

CHRISTY

This is a weather-vane that I made to find the wind direction. I used a compass to find where North was. I found that the

wind came from the northeast. Here are some clippings I got from a newspaper about the fire. (Shows clipping.)

JANET

We set out to find whether or not fire reduces topsoil. We found out that it does.

JANET AND LYNN

We took the measurements of the topsoil in the burned chaparral area on sloped land and level land. Before the fire on the level land in the chaparral the topsoil was over a foot deep. In the chaparral sloped area the topsoil was about 10 or 11 inches deep. After the fire on the level land the topsoil was about 9 or 10 inches deep. On the burned sloped area the topsoil was about 4 or 5 inches deep. This is a foot-long nail we used to measure the topsoil. Sometimes in the chaparral the topsoil was deeper than the nail is long so it was over a foot deep. This fire was called by the code name—Woodwardia Fire. It was named this by the Los Angeles County Fire Department after a fern that grows up there. There is also a Woodwardia Canyon in the fire area.

JOHN, TOM, RICHARD, AND CINDY

Our committee studied the equipment used to fight the fire and we made this booklet. (Shows booklet of plane types and tools.) This is the lead plane. It has a very dangerous job. It had to fly into the smoke and fire to show the PVY planes where to drop the borate solution. The planes were in constant danger from up-drafts and down-drafts of hot and cold air. The helicopters carried water bombs to drop on certain spots and also to re-seed the burned area with rye and mustard seed after the fire.

These are some of the pictures the Los Angeles County Fire Department sent us. (Shows pictures.) The water that the firemen used came from special permanent water tanks already in the hills and from water tanker trucks. Zuni Indians helped to fight the fire as they are very brave. Captain Hooper said many police helped people protect their homes. They set up road

blocks to clear the roads leading to the mountains. They also had to have rest camps where men could rest by the fire line. The fire burned north and when it's going that way it's very hard to control and also when it gets on top of a mountain.

MIKE AND LINDA

Some pupils brought cameras on the field trip and took pictures of the burned area. After we got them developed we brought them to school. Then Linda and I put them up on the board. The most frightening thing we saw were the great gullies made by the rain water as it ran off the burned slopes. Our main reason for taking the pictures was to see how the plants burned. We also wanted to find out if it burned all the undergrowth or just some of it. So we took pictures to make a record of it.

LINDA

Jane and I planted a tree at the Ranger Station. I made this speech: We, Mrs. Elgin's fifth grade class at Paradise Canyon School in nearby La Cañada, are happy to plant this tree as our contribution towards rebuilding this part of Angeles National Forest.

RUSSELL

I made a report on the chaparral before it was burned. The chaparral is made up of hard, tough, woody plants that grow low and close together. Little weak plants could not live there because of the heat. Here are some pictures of plants in the chaparral. (Showed booklet study, "Chaparral.")

JANE, SHERRY, AND KATHY

Sherry, Kathy, and I are going to tell you how this terrible fire can affect our watershed. We are going to show you some of the things that can happen after a watershed fire. There are many more.

JANE

I'm a sloshy, slushy, muddy lake, and the fish and plants that live from my waters will die because there isn't any good water.

SHERRY

I'm a little rabbit and I can't find any places for a home. The home I had was very good except it was burned and now I have no place to go. Oh, what shall I do, where shall I go?

KATHY (bends lower)

I used to be a beautiful stream. But after this fire I am getting lower and lower. Pretty soon I'll only be mud. I'm a piece of bare cold soil. My brothers and sisters have already been blown down the big hill and pretty soon I will too. Oh-o-o here I go-o-o——

SHERRY

I'm some rain water and I'm rushing down the side of the hill because there is no watershed to stop me. Pretty soon I'll run into big floods and make people unhappy because I'll ruin their homes because there's no watershed to stop me. Whee-e-ee!

KATHY

I used to be a beautiful reservoir, filled with clear, sparkling water. But after this fire I am all choked up and muddy!

JANE

I'm a little plant and my ground cover is lost, my roots can't hold me in this soil any more. Pretty soon I will blow away. Oh! Here I go-o-o!

SHERRY

I'm a little squirrel and I'm looking for some food, but I can't find any because it's all burned up. Now I'll die because of lack of food.

KATHY

Ouch! What was that? Ouch! I used to be a beautiful tree. But this fire has burned half of me and the other half of me will soon be destroyed by insects and disease. Ouch! Drat that bug!

JANE

I'm a fish (gulp, gulp, gulp). I can't find any oxygen in this muddy lake which used to be good, clear water. Pretty soon I will die (gulp, gulp, gulp).

SHERRY

I'm a little burned tree. I used to be beautiful and tall and had great big green leaves. My trunk could be used for wood. But when the fire came it burned me and now I'm a useless old stick.

KATHY

Oh, I'm angry! I'm a taxpayer. I'm angry because I have to pay taxes for the fire. I don't even live near the fire area. I live in Glendale! Oh, taxes!

MIKE

This fire did a lot more than burn all the brush and blacken the mountains. It destroyed the beauty and it will be years before it will be back again. (Holds up clod of soil bearing grass.) Look at this piece of soil—it is worth its weight in gold. We would like to share with you a quotation from the book, "Cry, the Beloved Country."

> "The grass is rich and matted—you cannot see the soil. It holds the rain and the mist, and they seep into the ground, feeding the streams in every kloof. It is well tended, and not too many cattle feed upon it; not too many fires burn it laying bare the soil. Stand unshod upon it, for the ground is holy, being even as it came from the Creator. (Bring up end of 'Neptune, the Mystic' from Gustav Holst's 'The Planets Suite'.) Keep it, guard it, care for it, for it keeps men, guards for men. Destroy it and man is destroyed."

SUCCESSFUL ACTIVITIES IN OUTDOOR SCIENCE AND CONSERVATION EDUCATION

"I remember the day I climbed to the top of San Jacinto."
"I won't forget making those markers for the nature trail."
"Do you remember how the stars looked through the pine trees?"

Comments such as these are made by girls and boys who participate in vital experiences in outdoor science and conservation education. A series of such experiences is presented in the brief accounts of various projects described in the pages which follow.

These descriptions reflect the rich variety of experiences enjoyed by girls and boys in both urban and rural environments. They indicate the intelligent utilization of community resources and the creativity of the leaders who formulated the plans. They also describe the diligence and resourcefulness of those who carried out the plans. Frequently these are the same persons who had the original idea.

These descriptions of unique experiences had value in their own setting. None would probably be entirely suitable in another situation. However, with appropriate modifications to suit local interests, needs, and resources, many schools could carry on similar activities.

These descriptions are included in the hope that they will inspire persons interested in outdoor science and conservation education to undertake similar projects and will inform them regarding sound ways of providing vital experiences for children and youth.

After School Scavenger Hunt

Sylvia Forsyth works after school as a playground leader. She is a student teacher at the University Elementary School,

University of California, Los Angeles. Miss Forsyth wrote this description of a "scavenger hunt" she planned and conducted as an after-school playground activity for primary children.

The children were divided into five groups of ten children each. For identification each group had a different colored name tag.

The "hunt" involved the following tasks:

1. Writing a story or poem describing the plum tree blooming in the gully
2. Finding five rocks which are under one inch in diameter. Identify the rocks.
3. Finding some kind of living animal or insect in the gully

Certain of the groups worked as a whole on each task. Others divided into small groups, and each of these groups worked on one of the tasks.

At 2:40 p.m. all the children were called together to participate in an informal culminating activity. The collections of animals and insects and the stories and poems drew greater attention than the collection of rocks.

This "scavenger hunt" was very successful. All the children participated voluntarily and enthusiastically. The good feeling that prevailed throughout may have been stimulated by the social structure of the group, the activity in which the group was involved, and the influence of the outdoor environment.

The "hunt" stimulated the childrens' interest in their natural surrounding and made them increasingly aware of their need for understanding and learning about nature. Every group found five rocks but all had to speculate on the names of the rocks. One group gave the rocks personal names. This could open all kinds of possibilities for creative reactions from experiences in the outdoors.

The childrens' greatest thrill came from the discovery of the plum tree in bloom. Many of the children had never noticed it before. One leader led her group to discuss the possibilities of a future study of the trees in the gully. Karen's poem is an

example of a creative expression which came from this experience:

> The plum tree stands so little and strong,
> It stands like a dancing fawn. . . .

During the "hunt" no mention was made of "prizes" for the winners. The living animals and the poems seemed to be enough of a reward.

Vegetable Growing in the Second Grade

The purpose of this activity in Marguerite Lewis' second grade as reported by Lois Suydam, Principal in the Little Lake School District, was to discover how people in the neighborhood meet their need for food. The activity grew out of the study of the market.

The children decided to grow some vegetables and selected for their garden a piece of ground that was close to the classroom. The children wanted to know why the ground needed to be plowed, and this led to interest in the composition of soil. The children planted the garden, watered it, and weeded it when necessary. The need for insect control developed into an intensive study of insects. When the vegetables were mature, the children planned and served a luncheon for their parents and invited school personnel.

Through their participation in the garden project the children made growth in each of the following ways:

1. Began to understand the importance of good soil
2. Learned the usefulness of machines in helping people accomplish heavy work, such as plowing
3. Learned the importance of the growth cycle and that it takes time to complete growth
4. Learned why it is necessary to clean the vegetables thoroughly in order to prepare edible food
5. Improved their social behavior
6. Learned the importance of consistent endeavor in seeking desired results

Wise Use of Land

Mrs. Ingrid Riley teaches third grade in the Burbank Public Schools. The curriculum for this grade calls for a study of the city. As a part of the study, the teacher hoped to further pupils' understanding and appreciation of the procedures followed by the city in the disposal of trash and garbage, and in the maintenance of the equipment used in doing the job.

The class and teacher planned and went on a bus trip to Stough Park, in the Verdugo Mountains, to observe the "cut and fill" method used in disposing of trash and for preparing the land as a future park area. En route they observed civic buildings, a flood control dam, natural hillside vegetation, and a municipal golf course laid out in the hills behind the city. They stopped at the city service yards to see how garbage is collected and what uses are made of it. While they were at the yards they also saw how the city maintains its street sweepers and other heavy equipment.

The teacher concluded that this field trip stimulated considerable pupil activity in art work, map making, dramatic play, and such language arts activities as letter writing and story writing. The children's stories, in particular, gave evidence of changed attitudes and increased appreciation as they wrote of the future park. Their stories reflected some understanding why the city sells garbage and of the importance of keeping equipment in good working condition. The children also gained in their appreciation of the contributions made by city workers to the welfare of all.

A Fifth Grade Conservation Festival

Mrs. Leah Rawson, a teacher of the fifth grade in the Gladstone Elementary School District, is deeply interested in conservation and outdoor education. For many years she has collected and shared with her classes books, magazine articles, and nature materials. And each year she organizes a conservation festival to give the children in her class opportunity to review what they have learned about nature during the school year.

This festival is planned and conducted so that every pupil has opportunity to teach conservation by making a dramatic presentation or giving a demonstration of a topic of his choice and by being a guide for the classroom science museum.

All the classes in school, classes from a neighboring school, administrators, parents, and others are invited to attend the festival. During their visit they observe an outdoor demonstration with explanations of soil erosion and then divided into groups of five and toured the display tables, each group with a pupil as its guide.

Working in teams, the fifth grade girls gave flannel-board demonstrations of the water cycle. During Conservation Week the class presented two short plays in the auditorium. During the spring the class showed about 750 visitors what it had learned regarding the importance of conservation. The strength of this latter experience was in the sharing of learnings with others.

The Role of Plants as Soil Binders

Kenneth Slawson, a teacher of the fifth grade in the Long Beach Unified School District, thought his pupils should have opportunity to deepen their understanding of erosion forces and of the interdependence of soil and plants. This opportunity was provided through an activity which was planned so that the pupils would discover and understand the following facts about nature and conservation:

1. Growing plants protect the soil from being washed away by breaking the fall and splash of rain.
2. Dead leaves act like a sponge by holding back the water until it can soak into the soil.
3. Roots form a network which prevents the soil from being washed away.

In a previous lesson the children had learned that when water is permitted to wash away topsoil, the land is no longer good for farming and that there are ways of controlling flowing water so that it works for rather than against us. The children

decided that they would like to perform some experiments to learn firsthand in what ways water can be an enemy and what defenses can be used against it.

Their experiments included covering two boards about a foot square with layers of soil an inch thick. On one board small twigs were mixed into the soil; on the other only the soil was left. The two boards were then held over the sink and sprinkled with equal amounts of water. This was done by punching holes in the bottom of milk cartons and then pouring the same amounts of water into each one while it was being held two feet above the board. As water began to flow down the soil into the sink, the children observed the results. The experiment was then repeated, once with dead leaves placed over the soil of one of the boards, and one with sod on one board. In each experiment the results were the same. Water falling on barren soil quickly washed into the sink, carrying soil with it. Water falling on sod or soil covered with leaves was held back, trickled off slowly, and carried little soil into the sink.

The pupils were eager to evaluate and share what they had learned from the experiments. They quickly noted how the twigs broke the fall and splash of the raindrops on the soil; how the dead leaves acted like a sponge on soaking up the water; how the roots of the grass held the soil and prevented it from washing away. They also observed how quickly the unprotected soil washed away.

One pupil pointed out that plants and soil are partners. The plants get food and water from the soil and in turn, the plants protect the soil. Without soil the plants would be unable to grow. Without plants, the soil would be washed away during heavy rains or strong windstorms.

Soil Erosion and Its Prevention

Mrs. Rhoda Bergman, a seventh grade science teacher in the Beverly Hills Unified School District, encouraged each child in her classes to select and develop a science project. To start them thinking about the project she asked questions such as:

"When you turn on the faucet, do you know the source of the water and how it is brought to your home? Do you know why farm fields look as they do when you see them from a plane? Why are we glad to have a rainy winter in Los Angeles?"

Since Bruce was interested in planting, one question sparked his interest and off he went to plan his project on why and how certain plants are used in erosion control. Bruce's report of his project tells that he has always been interested in soil conservation. For his science project he decided to make a model of two farms. One farm would show the main types of soil erosion, the other would illustrate the uses and value of good soil conservation practices.

First, he had to do research on soil erosion types and on conservation practices to enable him to select what he could in his own words "cram" into the display space available.

Inside a shallow box he placed a thick piece of styrafoam for a base. Over this he shaped a modeling compound into hills and terraces. Adding sideboards and back-board, he proceeded with painting and landscaping his farms to make them look as real as he could from what he knew of each crop. During this period his parents were able to take him to look at a few hillside farms still to be found in the vicinity of this sprawling city.

The project opened up a new field of landscaping and modeling. Bruce learned that he could find out many things by writing to experts. He thought that this project helped him learn to do research and present his ideas in a meaningful way.

Class Garden Provides Opportunities for Integrated Learnings

Pupils in the eighth grade taught by J. R. Rodriguez in the Little Lake School District noted in their science books the following statement which appeared both intriguing and challenging to them. "What would you say if you read this headline in the newspaper today? 'Illinois and Indiana Destroyed!' Yet if you should put together all the land in the United States that has been made poor for growth of crops, it would cover more land than the area of both these great states."

The pupils decided to turn to the school grounds to see if the soil would produce a good garden of vegetables and flowers. A satisfactory plot of ground was selected near the classroom. All members of the class became the enthusiastic "Gardeners of Room 801." They wanted to plant a garden and to watch it grow. This gave the teacher opportunity to guide the class in the study to gain some firsthand experience in soil conservation, photosynthesis, plant morphology, and soil composition. The pupils displayed interest and enthusiasm because they could see a real purpose for learning.

In planning the garden, attention was focused on choosing a plot of ground, preparation of the soil, mapping the garden, working the garden, building a fence around it, writing for information on gardening, and visiting a gardener and his garden. Committees of four or five pupils were organized to carry out each of these projects.

A garden plot 30 feet wide and 50 feet long was laid out. A fence four feet high was built around the plot. Tomatoes, onions, radishes, carrots, lettuce, and seven varieties of flowers were planted. Everyone had a part in doing the planting. During Public Schools Week activities, the pupils' parents were invited to see the results of the class efforts.

Each committee kept a log of activities in a notebook, and many references have been made to them. When the garden had been planted and all phases evaluated, the pupils were actually surprised about the many things that had been accomplished. At present the garden is growing well and the pupils exhibit interest and pride in it. The teacher believes that the time and effort involved were worth while. So far as tangible learning is concerned, the following areas were emphasized:

1. Arithmetic —Arithmetical processes
   Elementary geometry
   Elementary algebra
2. Language —The stories and notebook logs emphasized punctuation, grammar, spelling, and

word usage. Oral reports were given. Evaluation of accomplishments took place

3. Science —Photosynthesis, soil conservation and composition, plant growth and structure
4. Social Studies—Working together co-operatively in group and committee activities

The intangible learning can be expressed in the following manner:

1. Appreciation of nature and the miracle of growth
2. Satisfying reward for hard work
3. The importance of soil and how it affects our lives
4. Understanding of the intricate balance of nature

Richardson Junior High School Science Club Conservation Project

The Richardson Junior High School Science Club, San Bernardino School Districts, with Gerald Stoops, as faculty sponsor decided to undertake a conservation project. This decision was made after the club visited the scene of the 1959 Lake Gregory Fire and saw what was left on the 12,000 burned-over acres.

The U. S. Forestry Service has specified 40 acres of forest land for the club to use in developing a long-range conservation project that will include terracing, building check dams, building ponds, and planting trees and grasses. The club now has over 2,000 young Jeffrey pines growing in its nursery. Work is done on weekends and during vacation. No school time is being used for the project except for planning.

After rainstorms the club has visited the area and seen the examples of erosion from the fire-denuded hills and mountain slopes. Some check dams that the club built have already been filled with silt from the run-off and will have to be replaced.

Artesia Pupils Demonstrate Conservation in School Grounds Erosion Problem

A special education class from the Artesia Elementary School District, Los Angeles County, was fortunate to have

Elizabeth Newcomb for its teacher. The group became aware of severe erosion problems on their school grounds and then did something about it.

The pupils had spent a week at an outdoor school and on many of their hikes had seen the effects of erosion. When they returned they observed that a heavy rain had caused the bank on the edge of their new school grounds to begin washing away. They then decided to take the action needed to prevent this condition from continuing. Their problem was three-fold: (1) they had to keep water from flowing down the bank; (2) they had to terrace the bank for planting; and (3) they had to plant perennials and then put down a cover to hold the soil until the perennials were established. In doing the work, pupils have developed a deep sense of pride in their school and community. They have learned valuable skills and acquired understanding of conservation. The pupils will continue to grow in all these ways, for the project is far from completed and the pupils are eager to do the work that remains to be done.

THE COMMUNITY CO-OPERATES IN OUTDOOR EDUCATION PROGRAMS

California schools have had the help of the community and its members in their outdoor education programs. In one county a fathers club has set up a county museum. With the cooperation of the city recreation department, a junior museum has been set up in another school district. In still another school district, fourth grade pupils had the help of the parent-teacher association, a local nursery, and soil conservation districts in planting a windbreak on the schoolgrounds. Details of these and other projects are presented briefly here.

County Museum Aids Outdoor Education

Gerald A. Smith, Superintendent of the Bloomington Elementary School District, San Bernardino County, reports on the values of the San Bernardino County Museum which was established for the school children by the Bloomington Dad's Club. The museum contains displays of (1) the culture of Southern California Indians; (2) the pioneer period of San Bernardino County; and (3) the natural history of the area. The boys and girls of the Bloomington schools have helped to prepare many of the displays in the museum; they have painted backgrounds and have arranged displays after research on the subjects. Most of the rock and mineral collections on exhibit are the result of study trips the pupils have made to the mountains and desert. One class is developing a cactus garden near the museum. A desert camping area at Joshua Tree National Monument that will be conducted in conjunction with the museum is now being established.

At times, visitors from the different Indian tribes of the area come to the museum and visit with classes studying the exhibits. Sometimes the museum sponsors desert field trips with artist

Charles La Monk to photograph and to draw the ancient writings of prehistoric tribes.

Sausalito's Outdoor Program Develops Appreciation of State's Resources

Marjorie Sutthoff, fourth grade teacher in the Sausalito Elementary School District, wished to help the pupils in her class to understand the natural resources of California and what efforts are being made to conserve them. An approach was made by forming a Junior Audubon Club. As part of the club's activities the pupils visited the migratory bird sanctuary at Tiburon and also Muir Woods on Mt. Tamalpais. On Luther Burbank's birthday the club presented four seedling Coast Redwoods to the school. The club has visited Golden Gate Park and the Museum of Natural History in San Francisco and has taken nature walks on the school grounds and observed the new growth of trees, shrubs, and the many birds of the vicinity. It has prepared a large nature exhibit including collections of bird and animal stamps, photographs, and science materials.

Palo Alto Junior Museum Facilitates Herpetology Study

The Palo Alto Junior Museum is operated for the purpose of helping children become acquainted with animals and informed regarding their natural habitats. Robert Wood, a member of the Palo Alto Recreation Department, reported how the museum helped a group of pupils in grades five and six to complete a herpetology study. In this study of snakes, the museum helped the boys and girls to recognize the difference between poisonous and nonpoisonous snakes and also demonstrated the place the snake occupies in the balance of nature.

Fourth Grade Pupils Spark School-community Co-operation

Mrs. Grace Lovewell, Mrs. Dorothy LaMance, Mrs. Elizabeth Coke, teachers, with Hugh West, Principal of the Bon View School in Ontario, found that ten-year-olds can spark a

school-community project better than many adults. For what came out of the fourth grade classrooms at Bon View School will endure for years in the minds of the pupils as well as adults in the community as a living testimonial to what can be accomplished when people join interests.

Bon View School, which is on a site exposed to the normal wind and fierce Santa Ana, found itself on the receiving end of sand storms whipped up from the agricultural areas around the school. The pupils in fourth grade, who at this time were engaged in the study of soil conservation wondered whether trees scientifically planted to serve as windbreaks would shelter their school grounds from the wind and dust clouds which buffeted their school. The principal arranged a meeting for the pupils with teachers and soil district consultants. The parent-teacher association became interested in the project. The Little Rock Nursery of the Antelope Valley Soil Conservation District contributed some trees for planting, and the Cucumonga Mountain View Soil Conservation District supplied an expert to advise how the trees should be planted to get the best possible windbreak.

During the past few months over 600 trees have been planted on the border of the school grounds and nearly 1,000 more must be planted before the windbreak is complete. In the windbreak the first barrier to the wind will be *Eucalyptus compacta,* which bushes from the ground and forms dense foliage 12 to 14 feet high. The major buffer will be Red Gum, *Eucalyptus rostrata,* whose 80 to 110 feet height will provide a wind shield 12 feet for every foot of tree height. The final buffer will be Aleppo Pine that grows to a height of from 40 to 60 feet. The eucalyptus trees will grow approximately four feet in height annually. The completed windbreak will protect the school grounds from the severe winds that would normally sweep across it.

Conservation Never Ends

The fifth grade class of Orchard Dale School, East Whittier Elementary School District, went on a field trip to the Audu-

bon Center at El Monte. Their teacher, Dorothea Balloch, tells about the trip which was a motivating factor in a unit on conservation. The class eagerly awaited the day of the field trip. They had prepared carefully by setting goals and listing questions to be answered. Many new words became part of the children's vocabulary.

At the Center, the class gathered around a sun dial. The naturalist explained its place in history and the children were fascinated. They noted the position of the shadow so they could see if it had moved by the close of the visit. The water conservation display was examined. The value of sod in holding the topsoil and increasing subsurface water was spectacularly shown by comparing the results of rainfall on barren and grass covered slopes.

The children tiptoed to the frog pond. Several big frogs sat along the bank. Pond turtles and crayfish were seen among the water plants. The naturalist helped the children to see that the pond is a natural community of plants and animals with a balance maintained between all forms.

Several varieties of birds flew by. The children learned that they could recognize the birds by their actions, calls, and colors. Occasionally a rabbit scurried along the path, and tracks of other animals were found frequently. One little gopher popped his head in and out of the holes he had made.

In the museum the children saw mounted birds, live chipmunks, an ant colony, a hive of bees, snakes, tarantulas, termites, and pack rats.

Back in class the children worked in committees, collecting materials, reading them and selecting the most valuable facts. One committee studied birds. They found out about their structure, habitats, food preferences, and migrations. When they discovered that some birds, such as the passenger pigeons, have become extinct, they read to find out why. Another group studied fish. They learned about the depths at which certain fish live and whether they live in arctic or tropic waters. Each of three other groups worked on the study of mammals, am-

phibians, and reptiles. All the study groups prepared charts and reports which they presented as the culmination phase of their work.

One of the outcomes of the learning from this unit was the realization that nature has provided each form of life with a body well adapted to its needs. Each animal lives in an environment that provides shelter, food, and protection. However, some animals in each area may depend upon eating other animals rather than the vegetation found in the area. The result is a natural balance between the plant life and animal life, each held in check by other forms that would destroy it and yet be able to survive in its own niche.

Now the children are noticing the news about the Mississippi River on the rampage. They are asking their parents to co-operate in conserving water. They are observing the natural world all about them. The study of this unit with its field trip has provided an excellent background for the outdoor school experience next year and for an interest in natural science in the years to come.

Reinforcing Conservation Concepts at Sunnyvale

Donn Wadley, Sunnyvale Elementary School District, describes a trip to a park in the foothills south of the school. The foothills of the area provide the children with the opportunity to study the water percolation system.

Three classes of sixth grade pupils were organized into trail groups of seven to ten children, each with an adult trail guide. The groups were conducted through a series of nine adjacent areas. The children had been prepared with essential information regarding these areas by class work and direction sheets furnished by the classroom teachers.

These directions indicated that the basic purposes of the trip were to provide the children with an opportunity to observe some of the things in outdoor science and conservation they had been studying during the school year. The following were among the observations that were to be made:

1. The life cycle of plants and animals and how one is dependent upon the other
2. The effectiveness of ground cover in maintaining soil fertility and in holding erosion to a minimum
3. How root systems extend beneath the surface of the soil and form networks that hold soil in place
4. How the basic elements of life—sunlight, water, oxygen —affect plant life
5. That in mountainous areas, water may be found within a few feet of the surface
6. That in the mountains where ridges come together water will often be found in streamlets or rivulets
7. That food may be found in the woods if one knows what to look for—wild plants, insects, and animals
8. That there are simple methods of eliminating erosion

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CALIFORNIA JOURNAL OF
ELEMENTARY EDUCATION

Official publication issued quarterly by the California State Department of Education, Sacramento 14, California. Entered as second class matter at the Post Office at Sacramento, California.

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